

SOME MADREPORARIAN CORALS FROM FRENCH SOMALILAND, EAST AFRICA, COLLECTED BY DR. CHARLES GRAVIER.

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Doctor Charles Gravier, of the Muséum d'Histoire Naturelle, Paris, kindly submitted to me for study and report that portion of the collection of corals made by him in 1904, in French Somaliland, that would safely bear transportation to this country. I accordingly received the so-called Astreans, the Fungids, the Astreopores, and the Goniopores. The type specimens, in the case of new forms, are the property of the Paris Museum; but paratypes or fragments of the types are in the United States National Museum.

As the collection was obtained at a locality just outside the mouth of the Red Sea, it is of special interest for comparison with the faunas of the Red Sea, the East Coast of Africa, and the regions farther to the east in the Indian Ocean.

I desire to express my thanks to Mr. J. Stanley Gardiner, of Gonville and Caius College, Cambridge, for kindly comparing photographs and my descriptions of *Orbicella annuligera* and the Cyphastreæ with his specimens from the Maldivé and Laccadive archipelagoes.

Genus *PHYSOGYRA* Quelch.

1886. *Physogyra* QUELCH, Reef Corals, "Challenger" Reports, p. 75.

Quelch established this genus for a coral that he described as *Physogyra aperta*, from Banda, and the *Pterogyra lichtensteini* Milne Edwards and Haime, of unknown habitat. The latter species has not, to my knowledge, been figured. Doctor Gravier obtained two species, which are subsequently described, from French Somaliland. In order to show the differential characters of the four recognized species I have prepared the following synopsis:

SYNOPSIS OF THE SPECIES OF *PHYSOGYRA*.

Without wall ridge on the colline summits:

Upper margins of the septa arched or flattened *P. somaliensis*, new species.

With wall ridge on the colline summits:

Valley axes narrow and deep.

Valleys, 15 to 18 mm. wide; septa, 2 to 3 mm. apart.

P. lichtensteini Milne Edwards and Haime.

Valley axes open and shallow.

Upper margins of the septa arched or flattened; valleys, 16 to 20 mm. wide; septa, 2 to 4 mm. apart. *P. aperta* Quelch.

Upper margins of the septa, distally abruptly elevated; valleys, 11 to 18.5 mm. wide; septa, 1.4 to 2 mm. apart, occasional intermediate rudimentaries. *P. gravieri*, new species.

PHYSOGYRA SOMALIENSIS, new species.

Plate XVII.

Apex of the base small, surmounted by a short, thick pedicel. The lower surface more or less corrugated concentrically, ascending at a low angle, with the margins in some instances slightly bent downward. Costae correspond to many or most of the septa; no epitheca; wall largely dissepimental in origin, often presenting a glazed appearance. The reflexed edge zone may extend some distance from the margin, or foreign objects may incrust the base to near the periphery. The upper surface is gently domed. The corallum is very vesicular and for its size extremely light.

Table of measurements.

Specimen.	Diameter.		Height.
	Greater.	Lesser.	
	mm.	mm.	mm.
No. 1	76	71	54
No. 2	134	121	83
No. 3a	161	150	80

† Figured type, Museum d'Histoire Naturelle, Paris.

Valleys more or less radiate in arrangement; longitude, up to 120 mm. on specimen No. 3; distance between the summits of adjacent collines, from 11 to 18 mm.; depth, about 8 mm. Calicinal centers distinct or indistinct.

Septa thin, distant, usually alternating in prominence, the taller, which are somewhat unequal, continuing to the summit of the collines, while the smaller ones, which usually are decidedly rudimentary, appear farther down on the sides of the collines in the loculi between the larger. There are 7 to 8 larger septa to the centimeter, and approximately the same number of smaller ones. The septal margins are entire; their upper portion gently arched or flattened, the outer ends may connect with the septa of the next series, or they may end abruptly on the colline summit; the inner margins fall abruptly to the bottom of the narrow axial furrow.

Dissepimental endotheca highly developed, forming vesicular ridges from 7.5 to 16.5 mm. across; dissepiments thin, from 1 to 2 mm.

apart; they arch upward and may reach, or very nearly reach the highest points of the septa. The collines composed of dissepiments and the outer ends of the septa; there is no wall lamella.

Columella poorly developed, consisting of a few septal processes, or absent.

Type.—Muséum d'Histoire Naturelle, Paris.

Paratype.—United States National Museum.

Remarks.—This species differs from the other three species of the genus by the absence of a wall ridge or lamella, and by having more numerous septa.

PHYSOGYRA GRAVIERI, new species.

Plate XVIII, figs. 1, 2.

Corallum very vesicular and light; subdiscoid in shape, with a thin, slightly reflexed edge. Greater diameter, 141 mm.; lesser, 125 mm.; height, 57 mm. The lower surface is almost, but not entirely, without epitheca; the edge zone evidently extended a considerable distance beneath the periphery, but there are some serpula tubes and molluscan shells attached to the base. The basal wall is largely dissepimental in origin, but apparently not entirely of that nature. Prominent, thin costae correspond to most of the septa.

Upper surface gradually rounded. Colline summits indicated by an imperfect, discontinuous, perforate wall; the distal ends of the septa elevated at a sharp angle.

Valleys more or less radiate in arrangement, rather straight or sinuous, they may be long, as much as 119 mm. in length; distance between colline summits, from 11 to 18.5 mm.; depth about 6 mm., but as the wall and the elevated distal ends of the septa form a ridge from 2 to 3.5 mm. tall, the valleys are really decidedly shallow. Calicinal centers distinct, average about 1 cm. apart.

Septa thin, distant, 5 to 7 large ones to the centimeter, with occasional intervening rudimentaries. The larger continue to the summits of the collines and, as has been stated, have their outer ends suddenly elevated and joined one to another by an imperfectly developed wall. The septal margins are microscopically dentate and form somewhat sinuous lines from points slightly above the base of the wall ridge to irregularly developed, somewhat ragged paliform lobes that surround the calicular axis. The inner edges of the lobes are steep, and surround the rather shallow calicinal centers.

Dissepimental endotheca very highly developed, forming vesicular collines that extend across from the bottom of one valley to that of the next, and arch upward to within 2 to 3.5 mm. of the wall summit. Dissepiments thin, arched, from 1 to 3 mm. apart.

Columella poorly developed, false, consisting of a few spinose processes from the inner ends of the septa.

Type.—Muséum d'Histoire Naturelle, Paris; a portion of the type in the United States National Museum.

Remarks.—The three particularly noteworthy characters of this species are, (*a*) the imperfectly developed, but elevated wall ridge; (*b*) the open, shallow valleys; (*c*) the sudden elevation of the septal margins along the colline summits. The last-mentioned character separates it from any of the previously described species.

Genus ORBICELLA Dana.

ORBICELLA MINIKOIENSIS Gardiner.

1904. *Orbicella minikoensis* GARDINER, Madrepor., Maldive and Laccadive Archipel., II, p. 774, pl. LXIII, fig. 35.

One fine specimen of this species, so similar to Gardiner's figure that it might have served as the type, was obtained.

ORBICELLA (LEPTASTREA) INÆQUALIS Klunzinger.

1879. *Leptastrea inæqualis* KLUNZINGER, Korallth. Roth. Meer., Pt. 3, p. 45, pl. v. fig. 6.

One specimen about the size of a man's fist was collected.

ORBICELLA (LEPTASTREA) BOTTÆ (Milne Edwards and Haime).

1850. *Cyphastrea? bottæ* MILNE EDWARDS and HAIME, Ann. Sci. nat., 3 ser., zool., XII, p. 115.

1857. *Cyphastrea bottai* MILNE EDWARDS and HAIME, Hist. nat. Corall., II, p. 486, pl. XLVII, fig. 1.

1879. *Leptastrea bottai* KLUNZINGER, Korallth. Roth. Meer., Pt. 3, p. 44, pl. v, fig. 6; pl. x, figs. 13a, 13b.

Two specimens were procured.

ORBICELLA ANNULIGERA (Milne Edwards and Haime).

Plate XX, fig. 3; plate XXI; plate XXII, fig. 4.

1850. *Astrea annuligera* MILNE EDWARDS and HAIME, Ann. Sci. nat., 3 ser., Zool., XII, p. 103.

1857. *Heliastrea annuligera* MILNE EDWARDS and HAIME, Hist. nat. Corall., II, p. 471.

1904. *Orbicella annuligera* GARDINER, Madrepor., Maldive and Laccadive Archipel., II, p. 774, pl. LXIII, fig. 32.

One specimen was submitted to me, and on it the following description is based:

Corallum of irregular shape, growth-form massive, attached by a portion of the lower surface; calices confined to the upper surfaces and the edges. There is no epitheca on the base, but outside the outer corallites there is considerable vesicular exotheca. The outer surface of this exotheca presents a minutely blistered and granulated appearance, with longitudinal costal striations that become more prominent on the periphery. Length, 152 mm.; width, 94 mm.; height, 86 mm.; thickness of living portion, 42 mm.

Calices circular or subelliptical, shallow, about 1 mm. deep, diameter from 3 to 3.5 mm., an occasional abnormal calice, 5 mm. The margins elevated about 1 mm. The free portion of the corallites below the calices is somewhat swollen and strongly costate, the costae alternating in thickness and prominence, the larger prolonged and meeting those of the adjoining corallites. Distance between calices from 1 to 2.75 mm., usually about 2 mm.; the distance apart is less than the diameter.

The septa normally form three complete cycles, occasionally a few quaternaries; primaries and secondaries stout, equal or subequal, and joined by wide prominent pali to the columella. The tertiaries are somewhat thinner, bear no pali, reach a little less than half the distance from the wall to the columella and nearly always have their inner ends free. All of the septa are thicker in the thecal ring and have costae, which have already been described, corresponding to their distal ends. The margins are finely dentate, somewhat elevated, arching above the edge of the wall; primaries and secondaries more prominent than the tertiaries. Septal faces minutely and densely granulate.

The pali are thick, wide, equaling in width the length of the septa, prominent, with an arched, finely dentate upper margin. They form a single crown, occur before the primaries and secondaries, which they join to the columella. Their faces granulate.

Thin endothecal dissepiments present; a coarser, vesicular, highly developed exotheca occurring between the costae.

Columella well developed, rather compact, bearing several papillae on its upper surface.

Remarks.—In those calices in which quaternaries are present, one or more of the tertiaries becomes elongated, paliferous, and fuses to the sides of a septum belonging to a lower cycle or extends to the columella. A few much enlarged calices have more numerous septa. Asexual reproduction is usually by budding between the calices, or by peripheral gemmation around the edges of the corallum, but among the abnormally large calices fission occurs.

Mr. J. Stanley Gardiner has compared photographs of this specimen and my description with his specimens from Minikoi and Goidu, and writes me that they are the same.

Genus CYPHASTREA Milne Edwards and Haime.

CYPHASTREA FORSKALIANA (Milne Edwards and Haime).

Plate XIX; plate XX, figs. 1, 2; plate XXII, figs. 1, 2, 3. (Plate XIX, plate XX, fig. 1, and plate XXII, fig. 2, are of one specimen; plate XX, fig. 2, and plate XXII, figs. 1, 3, are of another.)

1850. *Solenastrea forskaliana* MILNE EDWARDS and HAIME, Ann. Sci. nat., 3 ser., Zool., XII, p. 123.

1904. *Cyphastrea forskaliana* GARDINER, Madrep., Maldive and Laccadive Archip., II, p. 778.

Corallum of light texture, but of massive growth-form. Upper surface irregularly convex, with gentle undulations and some large humps; lower surface concave, with irregular, concentric corrugations and an epitheca that extends almost to the edge. Greatest length, 128 mm.; width, 67 mm.; height, 70 mm.; thickness of living portion, up to 25 mm.

Calices usually with slightly elevated margins, varying in height from a small fraction of a millimeter to 1 mm.; in some instances not raised above the exothecal surface. Their diameter from 1.5 to 2.5 mm., usually from 1.8 to 2 mm. Distance apart from 1 to 3 mm.; on the upper portion usually about 1.5 mm.; near the edges more distant. The calices are generally smaller and more crowded in the depressions; larger and more distant on the convexities.

The septa form three complete cycles, the primaries and secondaries reach the columella, but the former are slightly thicker; the tertiaries are short and thin, almost rudimentary. The outer ends of the septa are continued beyond the corallite wall and form distinct, rather acute costæ, alternating in size. The septa are thicker in the mural ring, becoming thinner outwardly toward the costal edges and inwardly toward the inner ends. The margins are exsert, steeply arched, the primaries and secondaries exceeding the tertiaries in height; the summit of the arch very obscurely dentate or entire, the inner and outer edges distinctly dentate; near the columella there are rather long teeth. The septal faces are densely granulated. Calicular fossa of moderate depth, about 1.5 mm. Columella vesiculate, very well developed, joining the inner ends of the primaries and secondaries.

In longitudinal sections of the corallites, the septa show numerous, irregularly disposed perforations, and many very delicate dissepiments.

The corallites are joined by a very vesicular exotheca, whose upper surface is composed of numerous blistery elevations that bear a great many small pointed spines. In a section of the corallum the exothecal vesicles are seen to occur in rather definite zones, about 0.5 mm. apart, the upper of any two zones being supported by the spines of the lower one.

Remarks.—A second specimen of *Cyphastrea*,^a which I believe should be referred to the same species, differs in a few particulars from the specimen just described. The differences are contained in the following notes:

Corallum of somewhat deformed, ellipsoidal shape, with calices distributed over its entire surface. Length, 67.5 mm.; greater diameter, 55 mm.; lesser diameter, 54 mm.

Calicular margins practically level with the exothecal surface, or slightly elevated above it, in one extreme instance about 1.3 mm. tall.

^aCf. Plate XX, fig. 2, and plate XXII, figs. 1, 3.

but about 0.5 mm. is an average. Diameter of calices from 1.5 to 2 mm.; distance apart, from 1 to 2.5 mm., usually equaling or slightly exceeding the diameter.

The septa usually form three complete cycles; primaries and secondaries of the same size, extending to and fusing by their inner ends with the columella; the tertiaries are short and thin.

A comparison of the two descriptions shows that the only real difference is the form. Since in all other characters they are identical, or as each specimen shows within itself sufficient variation to overlap with the other, I think that difference is not of specific value.

Klunzinger^a places "*Solenastrea forskalana* M. Edw. and H." in the synonymy of *Madrepora serailia* Forskål, employing the name *Cyphastrea serailia*. Doctor Gravier's specimen agrees perfectly with the description of Milne Edwards and Haime, and differs in no important particular from the specimens described by Gardiner from Hulule, but I do not feel at all sure that it is the same as Klunzinger's *Cyphastrea serailia*. It is to be regretted that Doctor von Marenzeller has not given us some notes on Forskål's type and additional information on the material studied by Klunzinger.

Genus APHRASTREA Milne Edwards and Haime.

APHRASTREA DEFORMIS (Lamarck).

1816. *Astrea deformis* LAMARCK, Hist. nat. Anim. sans Vert., II, p. 264.
 1848. *Aphrastrea deformis* MILNE EDWARDS and HAIME, Ann. Sci. nat., 3 ser., Zool., X, pl. ix, figs. 11, 11a.
 1849. *Aphrastrea deformis* MILNE EDWARDS and HAIME, Ann. Sci. nat., 3 ser., Zool., XII, p. 165.
 1904. *Aphrastrea deformis* GARDINER, Madrep., Maldive and Laccadive Archipel., II, p. 773, pl. LXIII, fig. 31.

A single excellent specimen that shows no noteworthy peculiarity was obtained.

Genus ECHINOPORA Lamarck.

ECHINOPORA EHRENBERGII Milne Edwards and Haime.

1849. *Echinopora ehrenbergi* MILNE EDWARDS and HAIME, Ann. Sci. nat., 3 ser., Zool., XII, p. 187.
 1879. *Echinopora ehrenbergi* KLUNZINGER, Korallth. Roth. Meer., Pt. 3, p. 56, pl. vi, figs. 7, 9; pl. x, fig. 15.

A small, young specimen of *Echinopora*, attached to the base of a specimen of *Orbicella bottae*, was collected at Djibouti. As the specimen is immature, its identification is not entirely positive, but it seems to be *E. ehrenbergi*.

^a Korallth. Roth. Meer., Pt. 3, p. 52, pl. v, fig. 4; pl. x, figs. 12a, 12b.

Genus FAVITES Link.

FAVITES SPINOSA (Klunzinger).

1879. *Prionastrea spinosa* KLUNZINGER, Korallth. Roth. Meer., Pt. 3, p. 39, pl. iv, fig. 7; pl. x, fig. 5.

Two specimens showing no special deviation from Klunzinger's description or figures were collected.

Genus FAVIA Oken.

FAVIA OKENI Milne Edwards and Haime.

1857. *Favia okeni* MILNE EDWARDS and HAIME, Hist. nat. Corall., II, p. 430.
1879. *Favia cavernosa* KLUNZINGER, Korallth. Roth. Meer., Pt. 3, p. 26, pl. iii, fig. 4. (Not Forskål.)
1904. *Favia cavernosa* GARDINER, Madrepor., Maldives and Laccadive Archipel., II, p. 767, pl. LXI, fig. 13.
1906. *Favia okeni* v. MARENZELLER, Riffkorall. Roth. Meer., p. 59.

Von Marenzeller studied the type specimen of Forskål's *Madrepora cavernosa* in Copenhagen and says that Klunzinger's identification is erroneous. Forskål's species groups with *Favia savignyi* Milne Edwards and Haime.

Doctor Gravier collected four specimens. They show considerable variation, particularly in the thickness of the septa and costae, but a detailed description seems superfluous.

FAVIA SAVIGNYI (Milne Edwards and Haime).

1849. *Parastrea savignyi* MILNE EDWARDS and HAIME, Ann. Sci. nat., 3 ser., Zool., XII, p. 173.
1879. *Favia clouei* KLUNZINGER, Korallth. Roth. Meer., Pt. 3, p. 29.
1879. *Favia chrenbergi* KLUNZINGER, Korallth. Roth. Meer., Pt. 3, p. 29, pl. iii, figs. 5, 7, 8; pl. ix, figs. 1a, 1b.
1904. *Favia versipora* GARDINER, Madrepor., Maldives and Laccadive Archipel., II, p. 766.
1906. *Favia savignyi* v. MARENZELLER, Riffkorall. Rot. Meer., p. 56, pl. xxv, figs. 84-89.

This species is represented by a suite of fifteen specimens that show a great amount of variation. Klunzinger and von Marenzeller, however, have described the variations of the species with such elaborateness that I shall not describe this suite. Klunzinger's figures, plate III, figs. 7, 8, represent these specimens very well; the calices of von Marenzeller's specimens are larger, judging by his figures. The Gravier specimens otherwise show the same range of variation, except Klunzinger's variety *laticollis* is not represented,

Genus GONIASTREA Milne Edwards and Haime.

GONIASTREA PECTINATA (Ehrenberg).

1834. *Astrea pectinata* EHRENBURG, Corallenth. Roth. Meer., p. 96.

1879. *Goniastrea pectinata* KLUNZINGER, Korallth. Roth. Meer., Pt. 3, p. 34, pl. iv, fig. 6.

1904. *Goniastrea pectinata* GARDINER, Madrepor., Maldives and Laccadive Archipel., II, p. 773.

Five specimens of this species were obtained. The calices, wall, septa, pali, and columella have been sufficiently described by Klunzinger and Gardiner, but the corallum has received only scant attention; therefore, I furnish the following notes.

The corallum forms subcylindrical masses with flattish upper surfaces, or is composed of large, truncate, ascending lobes.

The smallest specimen is a short, compressed column, somewhat swollen near its upper end, with a flattened upper surface. Greater diameter of base, 9 cm.; lesser, 7 cm.; height, 7.5 cm.

A second specimen: Greater diameter of base, 8 cm.; lesser, about 7 cm.; height, 11.6 cm. This specimen increases considerably in diameter with upward growth, having a diameter of 10.8 cm. just below its upper end.

Another specimen is 13 cm. tall; diameter of base about 10 cm. In form, it is a somewhat compressed column, with a truncate upper end. The next larger specimen is composed of several truncate lobes. It has a greater basal diameter of 15 cm.; lesser, 6 cm.; height, 13 or 14 cm. Between the lobes the corallum is dead.

The largest specimen is composed of two large lobes, each of which is secondarily lobate, with flattened upper surfaces. Greater diameter of the base, 24 cm.; lesser, 10.5 (the outline of the base is dumb-bell shaped); height, 18 cm.

Klunzinger says, "Ehrenberg's only specimen is convex, 6-8 cm. long and tall." Gardiner gives no information on the growth form of his specimens.

GONIASTREA RETIFORMIS (Lamarck).

1816. *Astrea retiformis* LAMARCK, Hist. nat. Anim. sans Vert., II, p. 265.

1879. *Goniastrea retiformis* KLUNZINGER, Korallth. Roth. Meer., Pt. 3, p. 36, pl. iv, fig. 5.

1904. *Goniastrea retiformis* GARDINER, Madrepor., Maldives and Laccadive Archipel., II, p. 772.

One specimen, which requires no special notice, was obtained.

Genus MÆANDRA Oken.

MÆANDRA PACHYCHILA Ehrenberg.

1834. *Mæandra* (*Platyggyra*) *labyrinthica* var. *pachychila* EHRENBURG, Corallenth. Roth. Meer., p. 99.

1879. *Colonia pachychila* KLUNZINGER, Korallth. Roth. Meer., Pt. 3, p. 15, pl. 1, fig. 6.

Four specimens were collected.

MÆANDRA LAMELLINA Ehrenberg.

1834. *Mæandra* (*Platyggyra*) *lamellina* EHRENBURG, Corallenth. Roth. Meer., p. 99.

1879. *Colonia arabica* KLUNZINGER, Korallth. Roth. Meer., Pt. 3, p. 17, pl. 1, figs. 1-3, 8; pl. ix, figs. 10a-10c.

1902. *Mæandra lamellina* VERRILL, Trans. Conn. Acad. Sci., XI, p. 69.

1906. *Mæandra lamellina* v. MARENZELLER, Riffkorall. Rot. Meer., p. 55.

A splendid suite of twenty-two specimens of this species was obtained, but Klunzinger has described its variation in so much detail that I can add practically nothing to what he has said.

Genus SCLEROPHYLLIA Klunzinger.

SCLEROPHYLLIA MARGARITICOLA Klunzinger.

1879. *Sclerophyllia margariticola* KLUNZINGER, Korallth. Roth. Meer., Pt. 3, p. 4, pl. 1, fig. 12.

This species is represented by three specimens, which, I think, should be described.

Table of measurements.

Specimen.	Diameter of calice.		Height.	Base.
	Greater.	Lesser. ^a		
	mm.	mm.	mm.	
No. 1	29	25	15	Broad.
No. 2	31	28.5	13	Do.
No. 3	47	41	47	About 15 mm. in diameter.

^a Measured to outer edges of the septa.

Two of these specimens are young, while the third is apparently adult. Specimen No. 2 corresponds closely with Klunzinger's description and the smaller specimen represented in his figure. The bases of specimens Nos. 1 and 2 of the table are almost as wide as the calices, and are attached to shells and various small objects. Epithea extends to the edge of the upbending of the wall. Specimen No. 3 is subconical. Its lower portion is badly corroded, and there is no epithea visible, but it may have been present and have been destroyed through corrosion.

The wall is thick, and has costæ that correspond to all septa and vary in prominence with the size of the corallum. In the large specimen they are very prominent at the calicular edge, but become subobsolete inferiorly; the largest 4.5 mm. tall, and 1.5 mm. thick, with thick, obtuse lobes or spines, that in some instances are 3 mm. long, on

their edges. These largest costae correspond to the primaries and secondaries; those corresponding to the higher cycles are thin and not so tall.

There are between four and five cycles of septa; in the smaller specimens the primaries are much thickened and there are some thickened secondaries. In the larger, the first two cycles are nearly equal. The septal margins become more exsert with increasing size; in the large specimen the primaries and secondaries project as much as 9 mm. above the edge of the wall; the higher cycles, less exsert. The strong costal spines continue upward on the first two cycles to the summit of the arch. The inner portion of the margins of these septa are without coarse dentations, but possess very small dentations, visible only with a lens. Near the columella there are one or two broad lobes, the margins within these lobes falling almost perpendicularly to the edge of the columella. The inner margins of the members of the higher cycles are dentate, even lacerate. The first three cycles extend to the columella; there is considerable grouping of the higher cycles around the tertiaries. Both the septal and costal faces are minutely granulate and decidedly rough.

The columella is well developed, elliptical in outline, flat above, and composed of a mass of anastomosing, fine trabeculae. It extends high up in the calice, in places the edge of the wall actually being lower than its upper surface.

Endothecal dissepiments present.

Genus GALAXEA Oken.

GALAXEA, species.

A single specimen of *Galaxea*, attached to the same object, a piece of dead coral overgrown with *Serpulia*, etc., as two specimens of *Favia savignii* Milne Edwards and Haime, was collected. The corallum is partly dead and appears to be abnormal. It probably is a stunted and deformed specimen of *Galaxea fascicularis* (Linnaeus).

The corallites are unequal in size, elliptical in cross-section. The maximum diameter of a calice, measured between thecal summits, 5.25 mm.; distance between calices from 2 to 4 mm.; height of corallites, measured to top of theca, 4.5 to 6.5 mm.; septal margins exsert, as much as 4 mm. Costae only slightly developed. In the largest calices there are three complete cycles of septa, with an occasional quaternary.

Without a considerable suite of specimens for comparison, I doubt if this specimen can be identified.

Genus *SIDERASTREA* de Blainville.*SIDERASTREA SAVIGNYANA* (Milne Edwards and Haime).

1857. *Astraea savignyana* MILNE EDWARDS and HAIME, Hist. nat. Corall., II, p. 508.

1879. *Siderastraea savignyana* KLUNZINGER, Korallth. Roth. Meer., Pt. 3, p. 77.

One somewhat depressed head, 15 cm. in diameter and 8.5 cm. thick, was collected. The specimen is typical.

Genus *COSCINARÆA* Milne-Edwards and Haime.*COSCINARÆA MONILE* (Forskål).

Plate XXIII, figs. 1, 2; plate XXIV, figs. 1, 2, 3.

1775. *Madrepora monile* FORSKÅL, Descript. Animal. quae in itin. orient. observ., p. 133.

1878. *Coscinaræa monile* KLUNZINGER, Korallth. Roth. Meer., Pt. 3, p. 79, pl. IX, fig. 4; pl. X, figs. 17a and 17b.

1890. *Coscinaræa mrandrina* ORTMANN, Zool. Jahrb., L, p. 297.

1906. *Coscinaræa monile* v. MARENZELLER, Riffkorall. Rot. Meer., p. 64, pl. XXIV, fig. 83.

Two specimens, one a young corallum attached to the base of *Siderastrea savignyana*, the other a small head 81 mm. in diameter and 60 mm. thick, were obtained. They agree precisely with the descriptions and figures of Klunzinger and von Marenzeller, the latter of whom has redescribed and figured Forskål's type.

As I think new figures desirable, they are herewith presented.

Genus *FUNGIA* Lamarck.

I have followed Professor Döderlein's *Die Korallengattung Fungia* in determining these species. Reference is made only to his memoir.

FUNGIA (CYCLOSERIS) PATELLA (Ellis and Solender).

1902. *Fungia patella* DÖDERLEIN, Korallengat. Fungia, p. 65, pls. I, II; pl. V, figs. 1, 2.

Twelve specimens.

FUNGIA (CYCLOSERIS) CYCLOLITES (Lamarck.)

1902. *Fungia cyclolites* DÖDERLEIN, Korallengat. Fungia, p. 77, pl. IV, figs. 7-9; pl. V, figs. 5, 5a.

One specimen.

FUNGIA PLANA Studer.

1902. *Fungia plana* DÖDERLEIN, Korallengat. Fungia, p. 111, pl. XI, figs. 2-5.

Eleven specimens.

Several of these specimens show interesting variation. Six of them are actually, or almost, typical *F. plana*; in four the costæ are decidedly thin, and those intermediate between the tall ones have finely dentate edges; the intermediate costæ of one specimen are to

the naked eye entire, but a lens reveals microscopic dentations. The specimens evidently are a connected series. They have suggested to me that Döderlein's *F. klunzingeri* may prove to be a variation of *F. plana*. This, however, must be taken merely as a suggestion, and not as an opinion, for the specimens studied do not warrant a conclusion.

FUNGIA CONCINNA Verrill.

1902. *Fungia concinna* DÖDERLEIN, Korallengat. *Fungia*, p. 113, pl. XII, figs. 1-3; pl. XIII, fig. 4.

Three specimens, furnishing the following measurements:

Specimen.	In plane of oral axis.	Trans- verse to oral axis.	Height.
	mm.	mm.	mm.
No. 1.....	119	115	79
No. 2.....	110	107.5	36
No. 3.....	91.5	98	48

The bases are concave, in No. 1, 49 mm. deep; in No. 2, 18.5 mm.; in No. 3, 28.5 mm.

These specimens have puzzled me exceedingly. As the smaller costæ are without spines, they appear to belong to the *F. damai* group; microscopic costal dentations and granulations, however, are present, making it most probable that they should group with *F. repanda*. The corallum base is imperforate; principal costæ and those next in size, thin, prominent, with slender, irregularly shaped, rough spines. Septa thin, unequal, with coarse, irregular dentations, 3 to 10 to the centimeter. Upper dental margins usually truncate; incisions between the teeth acute. The specimens are not typical, but I believe they must be referred to Verrill's *F. concinna*.

FUNGIA FUNGITES (Linnæus).

1902. *Fungia fungites* DÖDERLEIN, Korallengat. *Fungia*, p. 136, pls. XX-XXV.

Sixteen specimens.

Two variations are represented: 1. Corallum thin, near the margin 9 mm.; costæ thin, with small spines; septal margins finely dentate. 2. Corallum thicker, near the margin 16.5 mm.; costæ thicker with coarser spines; septal margins coarsely dentate. In the first form, the corallum is flat; in the second, arched above, with a concave base. The two forms represent the extremes of the series, a more detailed description seems superfluous.

FUNGIA ECHINATA (Pallas).

1902. *Fungia echinata* DÖDERLEIN, Korallengat. *Fungia*, p. 101, pl. x, figs. 1-5.

Two specimens.

Genus HERPETOLITHA Eschscholtz.

HERPETOLITHA FOLIOSA (Ehrenberg).

1873. *Herpetolitha foliosa* KLUNZINGER, Korallth. Roth. Meer., Pt. 3, p. 68, pl. VIII, figs. 4, 5.

Six specimens, four of which show distinct detachment scars. I have already called attention to this phenomenon in my Critical Review of the Literature on the Simple Genera of the Madreporaria Fungidae, with a Tentative Classification.^a

Genus ASTREOPORA de Blainville.

ASTREOPORA EHRENBURGII Bernard.

1896. *Astreopora ehrenburgii* BERNARD, The Genus *Astreopora*, Brit. Mus. Cat. Madrepor., II, p. 92, pl. XXXIII, fig. 15.

One specimen.

Genus GONIOPORA Quoy and Gaimard.

GONIOPORA SOMALIENSIS, new species.

Plate XXV; plate XXVII, fig. ^a1.

Corallum forming an undulated lamina attached by a portion of one side, the free edge broadly lobate. Extreme width, 89 mm.; width in sinus between lobes, 35 mm.; width along lobe, 62 mm.; greatest thickness, 10 mm. The margin is acute or obtusely rounded. The upper surface covered with calices; the lower, invested to the margin by a minutely, concentrically striate epitheca.

Calices of moderate size, from 2.5 to 4.5 mm. in diameter, usually about 3.5 mm.; polygonal, very shallow or superficial. Walls thin, poorly developed, reinforced by peripherally disposed synapticula.

Septal formula complete, that is, twenty-four in number, with typical gonioporid arrangement. Pali present before the primaries and secondaries, rather irregular in development; moderately prominent, consisting of separate granules, or those before a triplet and the primary joining its inner end, fused laterally. Usually there are two rough dentations between a palus and the mural denticle. Interseptal loculi narrow but open. The columella tangle extends outward beyond the pali; it is large, often with a tendency to compactness.

Type.—One specimen, one piece of which is in the Muséum d'Histoire Naturelle, Paris, the other in the United States National Museum.

Remarks.—Bernard, in his work on *Goniopora*, describes three forms that are similar to the one under discussion, namely: G. Barrier Reef (12) 1; G. North-West Australia (6) 2; G. North-West Australia (6) 3. The last one seems the nearest; it differs by having a closely encrust-

^aProc. U. S. Nat. Mus., XXVIII, 1905, p. 380, footnote.

ing corallum. As Bernard attaches no specific names to the forms described by him, the one here proposed will stand, even if it should be synonymous with one of his.

GONIOPORA DJIBOUTIENSIS, new species.

Plate XXVI; Plate XXVII, fig. 2.

Corallum rounded on the upper surface, transverse outline irregular, somewhat reniform; corallites rising from a small base, diverging upward, new corallites appearing in the angle between the older ones. The basal portion through a distance of from 44 to about 75 mm., depending upon where measured, is dead, and the epitheca, should it once have been present, has been eroded away. The edge of the living portion in places slightly projects downward over the dead portion, in other places it is flush with the dead. The projecting living edge is supported by epitheca; that part of the living portion flush with the dead is margined by epitheca. The epitheca is irregularly and finely wrinkled.

Dimensions of the corallum: Height, 104 mm.; greater transverse diameter, 131 mm.; lesser, 29 to 75 mm.

Calices subpolygonal or circular in outline; shallow, superficial to 1.5 mm. deep; fully grown ones, 5 to 5.5 mm. in diameter. The walls have a rough upper surface, about 1 mm. across, formed by the outer ends of septa.

Septal formula complete, 24 septa, with the typical gonioporiid arrangement. Interseptal loculi open, in width equaling or slightly exceeding the thickness of the septa. Septal faces roughly granulate; margins with several dentations corresponding to inwardly inclined, ascending trabeculae. About six pali in the superficial calices; indistinct or absent in the deeper ones.

Columella tangle large, more than half the diameter of the calice, extending outward to the inner ends of the tertiary septa; composed of concentrically arranged synapticula and fused inner ends of the septa: upper surface roughly spinulose.

Type.—Muséum d'Histoire Naturelle, Paris: a piece in the United States National Museum.

GONIOPORA STOKESI Milne-Edwards and Haime.

Plate XXVIII, figs. 1, 2.

1860. *Goniopora stokesi* MILNE EDWARDS, Hist. nat. Corall., III, p. 192.

Corallum forming masses that are hemispherical or domed above; base epithecate, flat, concentrically corrugated, concave, or, in the largest specimen obtained, truncate and inversely conical. The living portion is hemispherical or domed.

Table of measurements.

Specimen.	Base.		Corallum.		Height.
	Diameter.		Diameter.		
	Greater.	Lesser.	Greater.	Lesser.	
	<i>mm.</i>	<i>mm.</i>	<i>mm.</i>	<i>mm.</i>	
No. 1	60.5	58	61	59	31
No. 2	49	46	59	59	59
No. 3	53	53	65	58	51
No. 4	83	78	92	87	64
No. 5 <i>a</i>	128	115	147	134	168

a Base truncate, inversely conical, 97 mm. tall.

The young corallum is small, later corallites appearing in the angles between the older, the peripherally placed ones bending outward from the vertical axis.

Calices polygonal or subcircular in outline; decidedly deep, from 2.5 to 5 mm. or slightly more, shallower near the periphery, deeper on the top. Diameter on smaller specimens about 5 mm., on the largest 7 mm. Walls tall, range in thickness from dividing membranes to 1.25 mm., the septa continue upward to the summit as ridges, and have numerous perforations between them. The corners between the calices thickened.

The septal formula complete, 24 septa, with the typical gonioporiid arrangement. Interseptal loculi open, wider than the thickness of the septa, short, because of the great development of the columella tangle. Septal faces granulate, but not strikingly rough. There are no distinctly developed pali.

Columella tangle greatly developed, in some instances almost filling the corallite cavity, composed of centrically arranged synapticula and interlacing septal ends, upper surface flattish or somewhat domed, with fine spinulations.

Remarks.—This coral should be compared with Bernard's *Goniopora* Java Sea (4) 1 and *Goniopora* xa.

GONIOPORA PLANULATA (Ehrenberg).

1834. *Astraca planulata* EHRENBURG, Corallenth. Roth. Meer., p. 95.

1879. *Goniopora planulata* KLUNZINGER, Korallth. Roth. Meer., Pt. 2, p. 45, pl. VIII, fig. 23; pl. V, fig. 24.

1903. *Goniopora Red Sea* (6) 1 BERNARD, Genus *Goniopora*, Brit. Mus. Cat. Madrepor., IV, p. 100, pl. VIII, figs. 1, 2; pl. XIII, fig. 12.

It is unnecessary to redescribe this species, as it has been so fully considered by Klunzinger and Bernard. Doctor Gravier obtained two specimens, one a young corallum, the other large and composed of three incrassate lobes.

EXPLANATION OF PLATES.

PLATE XVII.

Physogyra somaliensis, new species, natural size..... p. 250

PLATE XVIII.

Physogyra graviori, new species..... p. 251

FIG. 1. Upper surface of corallum, natural size.

2. Tangential section, showing septa and dissepiments, x 4.

PLATE XIX.

Cyphastrea forskaliana (Milne Edwards and Haime), natural size p. 253

PLATE XX.

FIG. 1. Calices of *Cyphastrea forskaliana* (Milne Edwards and Haime) x 4.... p. 253

2. Calices of *Cyphastrea forskaliana* (Milne Edwards and Haime), x 4 .. p. 254

3. Calices of *Orbicella annuligera* (Milne Edwards and Haime), x 4 p. 252

PLATE XXI.

Orbicella annuligera (Milne Edwards and Haime), natural size p. 252

PLATE XXII.

FIG. 1. *Cyphastrea forskaliana* (Milne Edwards and Haime), natural size p. 254

2. *Cyphastrea forskaliana* (Milne Edwards and Haime), longitudinal section of corallites, x 4..... p. 253

3. *Cyphastrea forskaliana* (Milne Edwards and Haime), longitudinal section of corallites, x 4..... p. 254

4. *Orbicella annuligera* (Milne Edwards and Haime), longitudinal section of corallites, x 4..... p. 252

PLATE XXIII.

Coscinarina monile (Forsk.)..... p. 260

FIG. 1. Corallum, natural size.

2. Calices, x 5.

PLATE XXIV.

Coscinarina monile (Forsk.) p. 260

All figures, x 4.

FIG. 1. Tangential section of corallite, showing synaptacula.

2. Cross section of corallites.

3. Face of septum, showing trabeculae, perforations, and dissepiments.

PLATE XXV.

Goniopora somaliensis, new species, natural size p. 262

PLATE XXVI.

Goniopora djiboutiensis, new species, natural size p. 263

PLATE XXVII.

- FIG. 1. *Goniopora somaliensis*, new species, calices, x 4..... p. 262
2. *Goniopora djiboutiensis*, new species, calices, x 4..... p. 263

PLATE XXVIII.

- FIG. 1. Corallum, of *Goniopora stokesi* (Milne Edwards and Haime), natural size. p. 263
2. Calices, x 4.